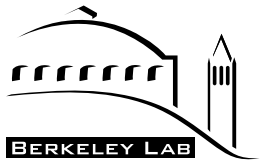

Quality Assurance Program Plan for NESHAP Compliance

Revision 6
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CONTENTS

1 INTRODUCTION 1

2 BACKGROUND 1

3 SCOPE 3

4 PROGRAM ELEMENTS 3

4.1 Organization, Authorities, Responsibilities, and Communication 3

4.2 Administrative Controls for Responding to Increased Emissions 7

4.3 Sample Collection and Analysis Procedures 9
4.3.1 *Sampling Sites and Points* 9
4.3.2 *Sampling Probes* 10
4.3.3 *Continuous Monitoring Systems* 10
4.3.4 *Sample Collection Systems* 11
4.3.5 *Laboratory Analyses* 11
4.3.6 *Sample Flow Rate Measurement* 12
4.3.7 *Effluent Flow Rate Measurement* 12

4.4 Quality Assurance Program Objectives 13

4.5 Quality Control 13

4.6 Sample Tracking 14

4.7 Maintenance, Calibration, and Field Checks 14

4.8 Audits 16
4.8.1 *Internal Audits* 16
4.8.2 *External Audits* 16

4.9 Corrective Actions 17

4.10 Reports 17

4.11 Quality Assurance Program Plan 18

5 REFERENCES 18

1 INTRODUCTION

As a U.S. Department of Energy (DOE) facility whose operations involve the use of radionuclides, Berkeley Lab is subject to the requirements of the U.S. Environmental Protection Agency's (EPA's) Code of Federal Regulations (CFR) Title 40, Part 61, the National Emission Standards for Hazardous Air Pollutants (NESHAP) (EPA 2006a). Subpart H of this regulation establishes standards for exposure of the public to radionuclides (other than radon) released from DOE facilities. This regulation limits the emission of radionuclides to ambient air from DOE facilities.

Under the Subpart H (subsequently referred to as NESHAP) regulation, DOE facilities are also required to establish a quality assurance program for radionuclide emission measurements. For existing sources, program elements that must be included in a quality assurance program plan are given in 40 CFR 61, Appendix B, Method 114, Section 4 (EPA 2006a). This plan documents Berkeley Lab's quality assurance program for compliance with NESHAP requirements by addressing each of the program elements.

2 BACKGROUND

Berkeley Lab is a multi-program national laboratory managed by the University of California for the DOE. Berkeley Lab's major role is to conduct basic and applied research in biology, physics, chemistry, materials, and energy. Berkeley Lab, the birthplace of the cyclotron, was founded by the late Nobel laureate, Ernest Orlando Lawrence, in 1931.

Berkeley Lab operates facilities where radionuclides are handled and stored and that are subject to NESHAP requirements. Radiochemical and radiobiological studies performed at Berkeley Lab typically use millicurie quantities of a wide variety of radionuclides, ranging from the lightest elements, such as ^{3}H (tritium), to the heaviest elements, many of which (such as californium and berkelium) were discovered at Berkeley Lab. In addition, radioactive materials are a by-product of charged-particle accelerator operations. Radioactive gases produced by accelerator operations are mainly short-lived radionuclides such as ^{11}C, ^{13}N, ^{15}O, and ^{18}F. All use or production of radioactive material at Berkeley Lab must be in accordance with an approved authorization or permit, which is issued by the staff of the Radiation Protection Group.

Berkeley Lab follows a graded approach to measuring emissions from major and minor sources; the current measurement approach was approved by EPA Region 9 on April 5, 2005. In accordance with NESHAP regulations, major sources are release points (such as stacks or radioactive material areas) where emissions could result in a potential effective dose equivalent to the nearest member of the public of 0.1 mrem/year or more. Berkeley Lab has no major sources. Minor sources are all other release points where airborne radionuclides could be emitted. All

sources at Berkeley Lab are minor sources. The graded measurement approach breaks down major and minor sources further into several categories, as shown in Table 1.

The graded measurement approach also distinguishes between sampling and monitoring. Sampling is the extraction of a representative portion of air through a collecting device (such as a filter) for subsequent radionuclide analysis. Monitoring is the extraction of a representative portion of air through an instrument that provides continuous, real-time measurement of airborne radionuclides.

The list of Berkeley Lab facilities where radionuclides are used varies from year to year as research needs change. At any given time, radionuclides have been authorized for use at between 50 and 150 different laboratories. The number of sampled or monitored release points at Berkeley Lab has ranged from about 12 to 60 stacks.

The NESHAP requirements of 40 CFR 61 clearly specify the methods that Berkeley Lab must use to monitor emissions from major sources. For minor sources, however, the NESHAP regulations require only that "periodic confirmatory measurements shall be made to verify the low emissions." Berkeley Lab applies, as best management practices, the same methods for

Table 1. Radionuclide NESHAP Graded Measurement Approach

Potential Effective Dose Equivalent (EDE) (mrem/y)[a]	Category	Requirements
EDE $\geq$ 10.0	Non-compliant	Reduction or relocation of source term and reevaluation prior to authorization.
10.0 > EDE $\geq$ 1.0	1	• Continuous sampling with weekly collection and analysis AND • Real-time monitoring with alarming telemetry for short-lived ($t_{1/2}$ < 100 h) radionuclides resulting in >10% of potential dose to the maximally exposed individual. •
1.0 > EDE $\geq$ 0.1	2	• Continuous sampling with monthly collection and analysis OR • Real-time monitoring with alarming telemetry for short-lived ($t_{1/2}$ < 100 h) radionuclides resulting in >10% of potential dose to the maximally exposed individual.
0.1 > EDE $\geq$ 0.01	3	Periodic sampling 25% of the year.
EDE < 0.001	4	Potential dose evaluation before project starts and when annual radionuclide use limits (as authorized by internal LBL documents) are revised; no sampling or monitoring required.

[a] Based on the potential to discharge radionuclides into the air assuming no pollution control equipment.

performing periodic confirmatory measurements on minor sources as are required for sampling and monitoring major sources. Where the methods specified by 40 CFR 61 are not appropriate for a particular minor source, Berkeley Lab applies other internationally recognized standards, such as DOE and American National Standards Institute (ANSI) guidance.

3 SCOPE

In general, quality assurance programs at Berkeley Lab are conducted in accordance with the *Operating and Assurance Plan* (LBNL 2000). The *Operating and Assurance Plan* recognizes that certain programs, such as NESHAP compliance, require a program-specific quality assurance plan. This NESHAP quality assurance program plan, like the *Operating and Assurance Plan*, provides the framework for Berkeley Lab staff to plan, manage, perform, and assess their work. The program described in this plan is implemented by "a system of policies, organizational responsibilities, written procedures, data quality specifications, audits, corrective actions and reports," as required by 40 CFR 61, Appendix B, Method 114, Section 4 (EPA 2006a). This plan addresses each program element listed in Method 114 and then refers the reader to the appropriate written documentation for implementation details. Because Berkeley Lab has no major sources, this plan applies to minor sources only.

4 PROGRAM ELEMENTS

4.1 Organization, Authorities, Responsibilities, and Communication

As stated in 40 CFR 61, Appendix B, Method 114, Section 4.1 (EPA 2006a):

> *The organizational structure, functional responsibilities, levels of authority and lines of communications for all activities related to the emissions measurement program shall be identified and documented.*

Berkeley Lab's Environment, Health, and Safety Division staff is responsible for compliance with NESHAP requirements. Responsibility for implementation of most NESHAP requirements rests with the staff of the Environmental Services Group; other Environment, Health, and Safety Division staff members provide support for NESHAP compliance activities.

Figure 1 presents the Lab-wide organizational structure and levels of authority of staff with responsibilities for NESHAP compliance. In addition, NESHAP compliance responsibilities are summarized below.

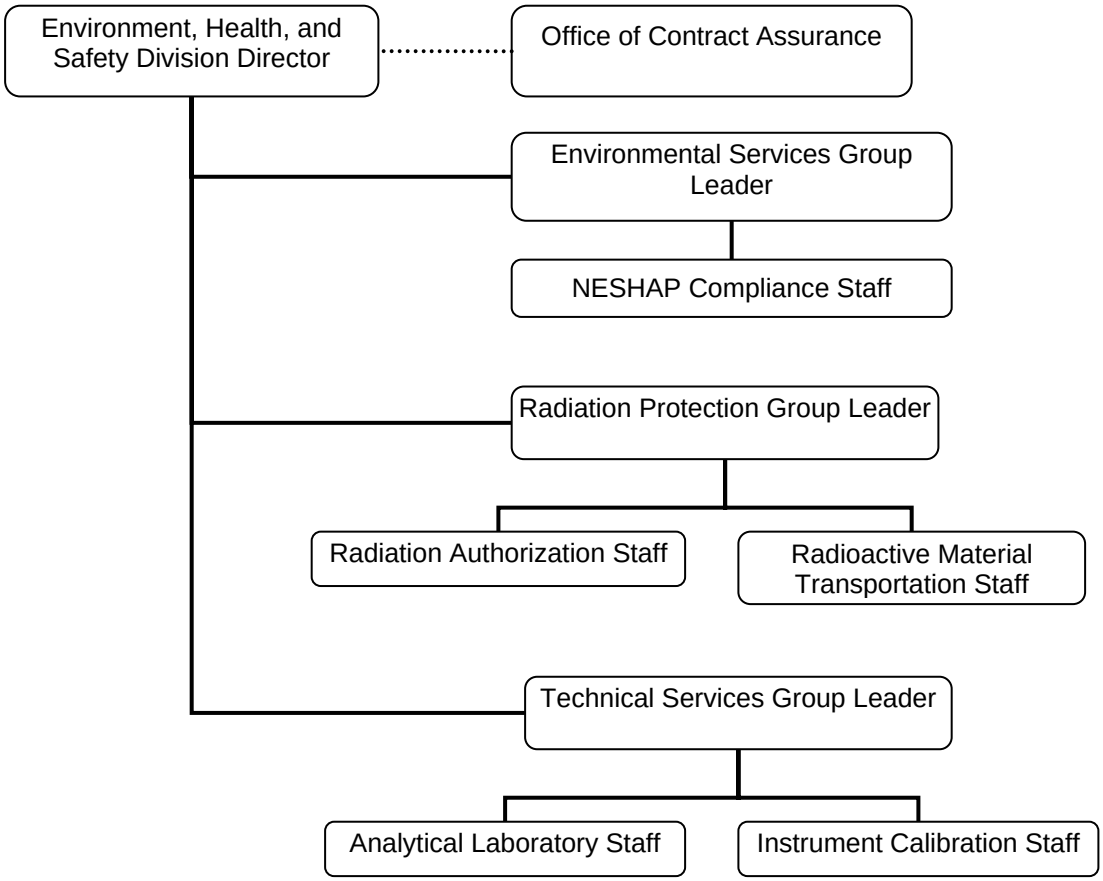

Figure 1. Lab-Wide NESHAP Compliance Organization and Authorities

- **Environment, Health, and Safety Division Director**: Oversees groups that conduct and support NESHAP compliance activities.
- **Office of Contract Assurance Staff**: Under the direction of the Laboratory Deputy Director, plans, conducts, and reports on internal independent audits of this NESHAP quality assurance program plan.
- **Environmental Services Group Leader**: Oversees environmental compliance and restoration activities, including NESHAP compliance; ensures that periodic reports of emission monitoring data are prepared and disseminated; approves this plan; assesses technical quality assurance; and tracks corrective actions.
- **NESHAP Compliance Staff**: Assumes responsibility for implementation of most NESHAP requirements (see below).
- **Radiation Protection Group Leader/Radiation Control Manager**: Oversees operational health physics, supervises Radiological Work Authorization/Permit Program and Radioactive Material Transportation Office staff. and serves as Berkeley Lab Radiation Control Manager

- **Radiation Authorization Staff**: Issues and maintains authorizations and permits for work involving radiation and maintains the authorization database.
- **Radioactive Material Transportation Staff**: Records receipts and deliveries of radioactive material to authorized users.
- **Technical Services Group Leader**: Supervises on-site radioanalytical laboratory and instrument calibration staff.
- **Analytical Laboratory Staff**: Analyzes stack effluent samples and prepares analysis reports.
- **Instrument Calibration Staff**: Calibrates real-time detectors and maintains telemetry systems.

As noted above, responsibility for implementation of most NESHAP requirements rests with the staff of the Environmental Services Group. Figure 2 presents the functional responsibilities of staff members within the Environmental Services Group who assume responsibility for NESHAP compliance. The NESHAP compliance staff responsibilities include the following.

- Determine the potential for radionuclide air emissions and apply criteria for sampling and monitoring.
- Obtain representative samples by identifying the sampling points, specifying sampling probes, collecting samples, tracking sample and effluent flow rates, and maintaining and calibrating monitoring and sampling equipment.
- Interpret analytical data, evaluate data quality, perform NESHAP dose assessments using EPA-approved methods, and prepare annual reports of radionuclide air emissions.
- Maintain this plan and coordinate audits of NESHAP compliance activities.
- Establish and maintain auditable records of NESHAP compliance.
- Oversee technical support vendors such as commercial radioanalytical laboratories that analyze samples and engineering consultants who install and calibrate instruments and provide independent audits of NESHAP compliance.

Communications between staff members in the Environmental Services Group who have responsibility for NESHAP compliance and staff members in other groups who support NESHAP compliance are summarized in Table 2.

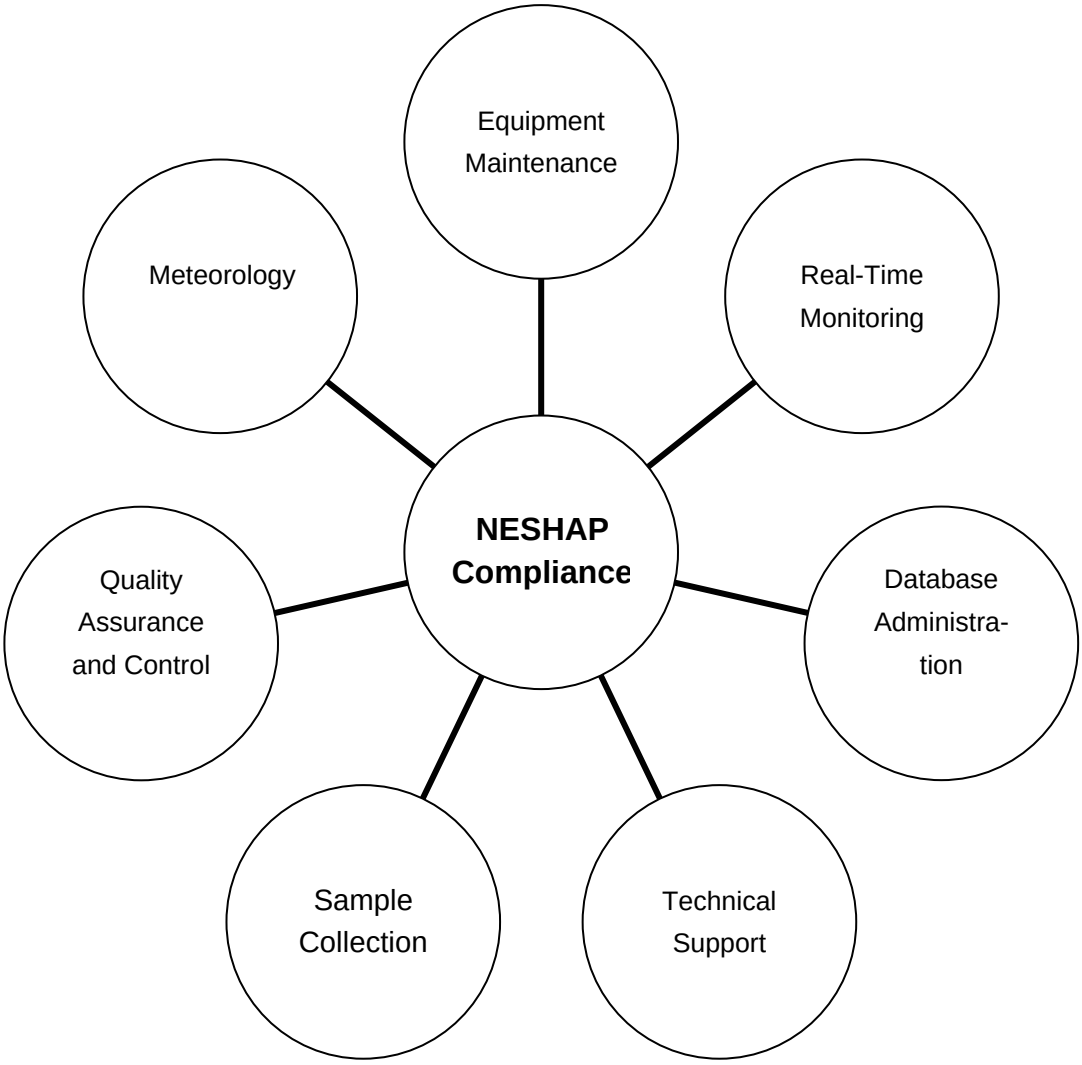

Figure 2. Environmental Services Group Functional Responsibilities for NESHAP Compliance

Table 2. Lines of Communication

NESHAP compliance staff communicates with	On issues related to
Environment, Health, and Safety Division Director	▪ Compliance with NESHAP dose limits ▪ Certification of annual report of radionuclide air emissions ▪ Transmission of annual report to DOE Berkeley Site Office
Office of Contract Assurance Staff	▪ Triennial audits of compliance with this quality assurance program plan ▪ Corrective actions for audit findings that affect regulatory compliance
Environmental Services Group Leader	▪ Authorization of compliance program expenditures ▪ Compliance with NESHAP regulatory requirements ▪ Approval of annual report of radioactive air emissions
Radiation Protection Group Leader	▪ Unplanned releases of airborne radionuclides to the environment ▪ Review of annual report of radioactive air emissions ▪ Radiation authorization policies ▪ Authorization database policies
	▪
Radiation Authorization Staff	▪ Changes to authorized work with radiation ▪ Authorization database information
Radioactive Material Transportation Office Staff	▪ Receipts of radioactive material by authorized users
Technical Services Group Leader	▪ Analytical laboratory policies ▪ Instrument calibration policies
Analytical Laboratory Staff	▪ Laboratory analyses and results
Instrument Calibration Staff	▪ Monitoring and sampling instruments
Technical Support Vendors	▪ Monitoring and sampling instruments ▪ Laboratory analyses and results ▪ Review of annual report of radioactive air emissions

4.2 Administrative Controls for Responding To Increased Emissions

As stated in 40 CFR 61, Appendix B, Method 114, Section 4.2 (EPA 2006a):

> *Administrative controls shall be prescribed to ensure prompt response in the event that emission levels increase due to unplanned operations.*

An unplanned emission is a release of airborne radionuclides that was not anticipated. In determining the sampling or monitoring requirements for a release point, the NESHAP compliance staff anticipates emissions by considering the dose from radionuclides potentially emitted from that release point. The potential effective dose equivalent is based on the quantity of each radionuclide that is authorized for use at the location and on an emission factor that takes into account whether the radionuclide is a solid, liquid, or gas (EPA 2006a). The potential

effective dose equivalent is then used to determine the measurement category of the release point (Table 1). If the dose from airborne radionuclides emitted from a release point are greater than the release point's measurement category, then an unplanned emission has occurred.

An unplanned operation is an activity that occurs without authorization. At Berkeley Lab, many controls are in place to ensure that all work proceeds under authorization (LBNL 2005). In addition, if unplanned operations do occur, many controls are in place to prevent increased environmental emissions. They include engineering controls (such as high-efficiency particulate air [HEPA] filters) and administrative controls (such as operating procedures). If these controls fail, additional controls are in place to ensure prompt response if environmental emissions increase due to unplanned operations. They include engineering controls (such as continuous stack samplers and real-time stack monitors) and administrative controls (such as reporting protocols). Reporting protocols are the subject of this program element.

Reporting protocols ensure that the NESHAP compliance staff is notified promptly of unplanned emissions and unplanned operations that could result in increased environmental emissions. Reporting protocols include

- reporting of preliminary results by analytical laboratories. As required by Procedure 206 (ESG 2004), on-site analytical laboratory staff notifies the NESHAP compliance staff within 24 hours if unusually high levels of radioactivity are measured. As required by the statement of work (LLNL 2004), off-site analytical laboratory staff sends preliminary results, when requested, by fax or e-mail.
- immediate reporting to the Environmental Services Group Leader of environmental spills or releases, in accordance with the Berkeley Lab *Health and Safety Manual*, Chapter 15 (LBNL 2005). The Environmental Services Group Leader, in turn, notifies the NESHAP compliance staff.
- timely review of data from continuous real-time monitors by the NESHAP compliance staff in accordance with Procedure 287 (ESG 2006d).
- notification of unexpected breathing-zone air-sampling results, collected to ensure worker safety if there is a potential for airborne radioactivity (RPG 2005). As required by specific radiation work permits, Radiation Protection Group personnel typically notify the NESHAP compliance staff as soon as possible if airborne radionuclides exceed a derived air concentration (DAC) that is protective of worker health (typically 1 DAC or less).

4.3 Sample Collection and Analysis Procedures

4.3.1 Sampling Sites and Points

As stated in 40 CFR 61, Appendix B, Method 114, Section 4.3.1 (EPA 2006a):

> *The sample collection and analysis procedures used in measuring the emissions shall be described including where applicable . . . identification of sampling sites and number of sampling points, including the rationale for site selections.*

This element comprises three distinct aspects of sample collection:

- identifying sampling locations (release points or locations from which radionuclides could be emitted) to be sampled or monitored for airborne radionuclides,
- selecting sampling sites (positions on exhaust stacks) where representative samples are withdrawn from the effluent stream, and
- determining sampling points (number of inlets on a probe) through which representative samples are withdrawn from the effluent stream.

Sampling Locations. The NESHAP compliance staff identifies locations to be sampled or monitored for airborne radionuclides in accordance with EHS Procedure 219 (ESG 2005a). The first step is to determine the potential to emit radionuclides from each release point (typically a radioactive material area or a stack) and the potential effective dose equivalent from that release point. Then the NESHAP measurement approach (Table 1) is applied to determine the potential impact category of the release point and the required sampling or monitoring. A current list of stacks that are sampled and monitored is maintained in the NESHAP compliance files, and an annual tabulation of release points in each category is published in the radionuclide air emission report (LBNL 2006a).

Sampling Sites. The NESHAP compliance staff generally chooses sampling sites in accordance with ANSI standards (ANSI 1969), EPA methods (EPA 2006c), and DOE guidance (DOE 1991). For particulate collection, sampling sites are located at least eight duct diameters downstream and two duct diameters upstream from any flow disturbance, such as a bend, expansion, or contraction in the stack. If the stack is too short, the sampling site should be at least two stack or duct diameters downstream and a half diameter upstream from any flow disturbance. For gases and vapors that are well-mixed, design criteria can be less rigorous (DOE 1991). At each release point currently being sampled or monitored, the site at which representative samples are withdrawn from the effluent stream is documented in the NESHAP compliance files.

Sampling Points. The NESHAP compliance staff generally designs sampling probes in accordance with ANSI standards (ANSI 1969) and DOE guidance (DOE 1991), as discussed in Section 4.3.2. At many sampling sites, a single inlet (nozzle) on a stack probe is adequate because

turbulent flow (having a Reynolds number greater than 2100) at these sites provides a well-mixed, uniform effluent stream. For each sampling location, the number of inlets on each stack probe is documented in the NESHAP compliance files.

4.3.2 Sampling Probes

As stated in 40 CFR 61, Appendix B, Method 114, Section 4.3.2 (EPA 2006a):

> *The sample collection and analysis procedures used in measuring the emissions shall be described including where applicable . . . a description of sampling probes and representativeness of the samples.*

The NESHAP compliance staff generally designs sampling probes in accordance with ANSI standards (ANSI 1969) and DOE guidance (DOE 1991). Probes are typically designed to be isokinetic (which ensures that a representative sample is obtained) or subisokinetic (which conservatively ensures that large particles are over-represented on the sampling medium). For gases and vapors that are well-mixed, design criteria can be less rigorous (DOE 1991). The design of each sampling and monitoring probe currently in use at Berkeley Lab is documented in the NESHAP compliance files.

4.3.3 Continuous Monitoring Systems

As stated in 40 CFR 61, Appendix B, Method 114, Section 4.3.3 (EPA 2006a):

> *The sample collection and analysis procedures used in measuring the emissions shall be described including where applicable. . . a description of any continuous monitoring system used to measure emissions, including the sensitivity of the system, calibration procedures and frequency of calibration.*

EPA does not require continuous monitoring of minor sources; however, Berkeley Lab may choose to implement continuous monitoring of these sources as the best method to measure emissions. For example, positron-emitting radionuclides are monitored at the Building 56 medical accelerator, although the accelerator is not classified as a major (Category 1 or 2) release point. Continuous monitoring systems are described in EHS Procedure 287 (ESG 2006d). Additional procedures describe the calibration of these systems (ESG 2006c), TSG 2001a, TSG 2001b). Design details and calibration records are maintained in the NESHAP compliance files.

4.3.4 Sample Collection Systems

As stated in 40 CFR 61, Appendix B, Method 114, Section 4.3.4 (EPA 2006a):

> *The sample collection and analysis procedures used in measuring the emissions shall be described including where applicable . . . a description of the sample collection systems for each radionuclide measured, including frequency of collection, calibration procedures and frequency of calibration.*

The radionuclides sampled from Berkeley Lab stacks are tritium (^{3}H), ^{14}C, ^{125}I, and particulate alpha- and beta-emitting radionuclides. Sampling is either continuous throughout the year or quarterly, in accordance with the EPA-approved NESHAP measurement approach (Table 1). A representative sample of the exhaust air passes through the appropriate collection medium (silica gel for tritium, sodium hydroxide for ^{14}C, charcoal for ^{125}I, and fiberglass filter for particulate alpha- and beta-emitting radionuclides). After a month, each medium is replaced with either fresh medium (for continuous sampling) or an empty cartridge (for quarterly sampling, until the next scheduled sampling period). As noted in Section 4.3.1, the NESHAP compliance files contain a current list of stacks that are sampled and monitored (including the radionuclides analyzed and the analysis frequency).

For each radionuclide sampled, the sample collection system and design details are maintained in the NESHAP compliance files. Sample collection procedures and annual calibration of sample collection systems are described in EHS Procedure 280 (ESG 2006c). Annual system calibrations are discussed further in sections 4.3.6 and 4.7.

4.3.5 Laboratory Analyses

As stated in 40 CFR 61, Appendix B, Method 114, Section 4.3.5 (EPA 2006a):

> *The sample collection and analysis procedures used in measuring the emissions shall be described including where applicable . . . a description of the laboratory analysis procedures used for each radionuclide measured, including frequency of analysis, calibration procedures and frequency of calibration.*

In accordance with the EPA-approved NESHAP measurement approach (Table 1), the NESHAP compliance staff sends samples collected weekly or monthly from Berkeley Lab stacks either to the on-site radioanalytical laboratory operated by the Technical Services Group or to an off-site commercial laboratory. The laboratories analyze samples in accordance with 40 CFR 61, Appendix B, Method 114 (EPA 2006a), as required by the EPA.

For the on-site laboratory, EHS Procedure 206 (ESG 2004) communicates the analytical and quality assurance requirements for environmental samples. The on-site laboratory prepares

analytical and quality assurance procedures (including calibration procedures and frequency), posting them on a website at http://ehswprod.lbl.gov/unc/tsg/procedures/lab_qc.asp and filing signed copies at the Radioanalytical Analysis and Measurements Lab in Building 26. The on-site laboratory also maintains a quality assurance plan (TSG 2006).

For off-site laboratories, a statement of work defines the requirements for performing and reporting analytical results of samples from both Berkeley Lab and Lawrence Livermore National Laboratory (LLNL 2004). The off-site laboratories prepare analytical and quality assurance procedures, which are proprietary and maintained in confidence in the NESHAP compliance files. These documents discuss calibration procedures and frequency.

4.3.6 Sample Flow Rate Measurement

As stated in 40 CFR 61, Appendix B, Method 114, Section 4.3.6 (EPA 2006a):

> *The sample collection and analysis procedures used in measuring the emissions shall be described including where applicable . . . a description of the sample flow rate measurement systems or procedures, including calibration procedures and frequency of calibration.*

Various types of meters measure the flow rate at which samples are continuously drawn from exhaust air for deposition on a collection medium, such as a filter or silica gel. These sample flow rate measurement systems are integral components of sample collection systems, which are discussed in Section 4.3.4. The NESHAP compliance staff calibrates sample flow rate meters in accordance with EHS Procedure 280 (ESG 2006c), which describes sample flow rate measurement systems, including how and when they are calibrated.

Calibration records are maintained in the NESHAP compliance files. Additional checks on sample flow rate meters and other components of sample collection systems are discussed further in Section 4.7.

4.3.7 Effluent Flow Rate Measurement

As stated in 40 CFR 61, Appendix B, Method 114, Section 4.3.7 (EPA 2006a):

> *The sample collection and analysis procedures used in measuring the emissions shall be described including where applicable . . . a description of the effluent flow rate measurement procedures, including frequency of measurements, calibration procedures and frequency of calibration.*

Methods for measuring the rate at which a volume of air is exhausted from a stack include the following.

- Measurement by the NESHAP compliance staff, which is performed annually. The NESHAP compliance staff uses this rate to determine emissions from sampled stacks.
- Measurement by sensors installed in the stack, the frequency of which meets or exceeds the frequency of radiological measurement. The NESHAP compliance staff uses this rate to determine emissions from monitored stacks.

EHS Procedure 287 (2004f) describes how to measure effluent flow rate and calibrate effluent flow rate sensors in accordance with EPA methods (EPA 2006b and 2006c), which is performed annually. The NESHAP compliance staff maintains reports of the results of effluent flow rate measurements and device calibrations.

4.4 Quality Assurance Program Objectives

As stated in 40 CFR 61, Appendix B, Method 114, Section 4.4 (EPA 2006a):

> *The objectives of the quality assurance program shall be documented and shall state the required precision, accuracy and completeness of the emission measurement data including a description of the procedures used to assess these parameters.*

The objective of the quality assurance program for NESHAP compliance is to ensure that radionuclide emission measurements are of known representativeness, precision, accuracy, completeness, and comparability. The Environmental Services Group staff has developed data quality objectives for each of these attributes. Data quality objectives, procedures for meeting them, and required values for each are described in EHS Procedure 252 (ESG 2001a). Additional details are provided in the specific analytical laboratory procedures (see Section 4.3.5).

4.5 Quality Control

As stated in 40 CFR 61, Appendix B, Method 114, Section 4.5 (EPA 2006a):

> *A quality control program shall be established to evaluate and track the quality of the emissions measurement data against preset criteria. The program should include where applicable a system of replicates, spiked samples, split samples, blanks and control charts. The number and frequency of such quality control checks shall be identified.*

The NESHAP compliance staff uses quality control data to evaluate and track the quality of emissions measurement data against preset criteria. Quality control data include analytical results of laboratory blanks, laboratory spikes, laboratory duplicates, sampling splits, and field blanks.

The on-site radioanalytical laboratory analyzes laboratory blanks, spikes, and duplicates in accordance with the schedule in Procedure 206 (ESG 2004) and prepares quality control charts in accordance with Procedures 310.2 (TSG 2003) and 310.3 (TSG 2005). The off-site laboratories

analyze laboratory blanks, spikes, and duplicates at frequencies required by a statement of work (LLNL 2004), which also governs preparation of quality control charts. All analytical laboratories analyze sampling splits, duplicates, and field blanks in accordance with the collection schedule in Procedure 280 (ESG 2006c).

Results of laboratory blanks, spikes, and duplicates are evaluated against the preset criteria provided in Procedure 252 (ESG 2001a). Results of sampling splits are evaluated against the following preset criteria: relative error ratio (RER) is less than one or relative percent difference (RPD) between samples analyzed at the same lab is less than 30% and between samples analyzed at different labs is less than 50%. Results of field blanks must be less than the laboratory's minimum detectable activity plus the 2-sigma error of the sample.

4.6 Sample Tracking

As stated in 40 CFR 61, Appendix B, Method 114, Section 4.6 (EPA 2006a):

> *A sample tracking system shall be established to provide for positive identification of samples and data through all phases of the sample collection, analysis and reporting system. Sample handling and preservation procedures shall be established to maintain the integrity of samples during collection, storage and analysis.*

The NESHAP compliance staff handles and preserves samples during collection in accordance with Procedure 280 (ESG 2006c) and during preparation for transport in accordance with Procedure 254 (ESG 2005c). Analytical laboratory staff handles samples in accordance with each laboratory's procedures (Section 4.3.5). The chain of custody is maintained throughout collection, transport, and analysis in accordance with Procedure 268 (ESG 2006b).

Analytical laboratory staff transmits results of analyses electronically or manually in accordance with a database procedure (in preparation) for the on-site laboratory and in accordance with a statement of work (LLNL 2004) for the off-site laboratory. The NESHAP compliance staff loads or enters data into the Environmental Services Group database in accordance with Procedure 255 (ESG 2005b), where they are reviewed, authenticated, approved, and maintained.

4.7 Maintenance, Calibration, and Field Checks

As stated in 40 CFR 61, Appendix B, Method 114, Section 4.7 (EPA 2006a):

> *Regular maintenance, calibration and field checks shall be performed for each sampling system in use by satisfying the requirements found in Table 2: Maintenance, Calibration and Field Check Requirements.*

The NESHAP compliance staff performs maintenance, calibration, and field checks as summarized in Table 3. Maintenance, calibration, and field checks are documented in the NESHAP compliance files.

Table 3. Maintenance, Calibration and Field Check Requirements

Sampling System Component[a]	System	Frequency	Procedure
Clean thermal anemometer elements	Kurz unit on stack flow measurement system	As required	287 (ESG 2006d)
Inspect pitot tubes for contaminant deposits	NA[b]	NA	NA
Inspect pitot tube systems for leaks	NA[b]	NA	NA
Inspect sharp-edged nozzles for damage	Sample flow system, particulate collection only	Annually	287 (ESG 2006d)
Check nozzles for alignment, presence of deposits, or other potentially degrading factors	Sample flow system, particulate collection only	Annually	287 (ESG 2006d)
Check transport lines of HEPA-filtered applications to determine if cleaning is required	Sample flow system, HEPA-filtered particulate collection only	Annually	287 (ESG 2006d)
Clean transport lines	Sample flow system, HEPA-filtered particulate collection only	Annually	287 (ESG 2006d)
Inspect or test the sample transport system for leaks	Sample flow system	Annually	280(ESG 2006c)
Check mass flow meters of sampling systems with a secondary or transfer standard	Sample flow system	Quarterly	280(ESG 2006c)
Inspect rotameters of sampling systems for presence of foreign matter	NA[c]	NA	NA
Check response of stack flow rate systems	Kurz unit on stack flow measurement system	Quarterly	287 (ESG 2006d)
Calibrate flow meters of sampling systems	Sample flow system	Annually	280(ESG 2006c)
Calibrate effluent flow measurement devices	Micromanometer or Kurz unit on stack flow measurement system	Annually	287 (ESG 2006d)
Calibrate timing devices	Sample flow system	Annually	280(ESG 2006c)

[a] From 40 CFR 61, Appendix B, Method 114, Table 2 (EPA 2006a)
[b] Not applicable; pitot tubes not used to continuously measure effluent flow rate
[c] Not applicable; rotameters not used to measure sample flow rate

4.8 Audits

As stated in 40 CFR 61, Appendix B, Method 114, Section 4.8 (EPA 2006a):

> *Periodic internal and external audits shall be performed to monitor compliance with the quality assurance program. These audits shall be performed in accordance with written procedures and conducted by personnel who do not have responsibility for performing any of the operations being audited.*

To monitor compliance with this quality assurance plan, both internally and externally directed audits are conducted periodically. Reports of all audits are maintained in the NESHAP compliance files.

4.8.1 Internal Audits

Berkeley Lab personnel or contractors to Berkeley Lab conduct internal audits.

- The Office of Contract Assurance staff conducts internal audits of compliance with this quality assurance plan in accordance with written procedures every three years. The Office of Contract Assurance staff does not have responsibility for performing any of the operations being audited.
- At the discretion of the NESHAP compliance staff, an auditor (who may be a Berkeley Lab employee or a consultant) may be requested to review and comment on various technical aspects of NESHAP compliance, including quality assurance. Such an audit is conducted in accordance with a written procedure (ESG 2006e). Persons assigned to perform audits do not have responsibility for performing any of the operations being audited.

4.8.2 External Audits

Personnel who conduct external audits are not employed by Berkeley Lab and thus do not have responsibility for performing any of the operations being audited. In the past, these auditors have included

- EPA Region 9 personnel,
- DOE headquarters personnel, and
- local DOE personnel, who routinely audit Berkeley Lab's environmental programs, including NESHAP compliance, by participating in field activities, meetings, workshops, and other day-to-day activities under the Operational Awareness Program (DOE 1998).

External audits are performed in accordance with each organization's audit schedule and written audit procedures.

4.9 Corrective Actions

As stated in 40 CFR 61, Appendix B, Method 114, Section 4.9 (EPA 2006a):

> *A corrective action program shall be established including criteria for when corrective action is needed, what corrective actions will be taken and who is responsible for taking the corrective action.*

Various situations may require corrective action. Corrective action is required when

- an auditor finds that compliance with NESHAP regulations is affected. The NESHAP compliance staff considers all issues raised during an audit to determine whether corrective action is required.
- the NESHAP compliance staff identifies nonconformances in accordance with Procedure 208 (ESG 2001b).
- the NESHAP compliance staff determines that the quality of NESHAP activities has been significantly and negatively affected.

When any of these criteria are met, the NESHAP compliance staff, with concurrence from the Environmental Services Group Leader, determines what corrective action will be taken and assigns responsibility for the action. Corrective actions are tracked using the LBNL Corrective Action Tracking System (CATS).

4.10 Reports

As stated in 40 CFR 61, Appendix B, Method 114, Section 4.10 (EPA 2006a):

> *Periodic reports to responsible management shall be prepared on the performance of the emissions measurements program. These reports should include assessment of the quality of the data, results of audits and description of corrective actions.*

By evaluating work processes, data quality, audit results, and corrective actions, the NESHAP compliance staff periodically assesses the technical qualityof NESHAP activities, thereby improving program performance. Assessments are conducted in one-on-one meetings between the Environmental Services Group Leader and NESHAP compliance staff and in monthly group meetings. Assessments are documented in status reports (maintained by NESHAP compliance staff) and meeting minutes (maintained in the Environmental Services Group files). The Environmental Services Group Leader also reviews audit reports, nonconformance reports, and corrective action plans prepared by the NESHAP compliance staff, as discussed in Section 4.9.

Other reports to managers include an annual report of airborne radionuclide emissions (LBNL 2006a) in accordance with 40 CFR 61 (EPA 2006a). The annual report is based on emissions data

that have been reviewed, authenticated, and approved in accordance with Procedure 252 (ESG 2001a). The NESHAP compliance staff calculates doses for the annual report in accordance with Procedure 218 (ESG 2006a). In addition, the Environmental Services Group staff prepares an annual site environmental report, which includes chapters on air emissions and dose assessment (LBNL 2006b). Data in this report are calculated and reported in accordance with Procedure 253 (ESG 2003).

4.11 Quality Assurance Program Plan

As stated in 40 CFR 61, Appendix B, Method 114, Section 4.11 (EPA 2006a):

> *The quality assurance program should be documented in a quality assurance project plan that should address each of the above requirements.*

This plan documents Berkeley Lab's quality assurance program for compliance with the NESHAP requirements by addressing each of the program elements listed in 40 CFR 61, Appendix B, Method 114, Section 4, "Quality Assurance Methods" (EPA 2006a). The NESHAP compliance staff reviews this plan annually and revises it as necessary.

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